3. Strictures = Selective Bypass

4. Sclerosing cholangitis = multiple strictus dilatation of CBD

- Choledochal cyst
  - Pre-malignant
  - Type I - Fusiform CBD
  - Excision cyst + Roux en Y hepaticojejunostomy
  - Lateral sacular dilatation

- Intraduodenal dilatation

- Intrapancreatic CBD + Intrahepatic dilatation

- Caroli's (multiple intrahepatic cyst)

6. Chronic pancreatitis

Causes = Alcohol, malnutrition, hereditary, cystic fibrosis, autoimmune

CLF = MOPED

Diabetes

Malabsorption

Pain

Exocrine pancreatic dysfunction
4. Cholangiocarcinoma
   - GB not palpable
   - Klatskin tumour is a C.C.
   Types: peripheral, intrabiliary, distal
   Mxx: Stenting is curable
   - Resection = Hepaticojejunostomy

5. Congenital biliary atresia
   - Kasai's (surgical drainage of bile)
   - Liver transplant

6. Ca GB: CA 19-9 elevated

7. It: 1) If found at chole and mucosa alone is involved than not try.
   2) If wall is involved than extended chole = Segmental wedge deserved of liver
   + Regional lymphadenectomy

9. Parasites
**Causes of Hematuria**

- Passage of blood mixed with urine

**Site**

- Kidney
  - Infection: Ac. GN, TB
  - Infection: SBE, massive hemolysis, mismatched BT
  - Injury: Trauma
  - Tumor: WT, RCC, TCC
- Stones
- Polycystic kidney

**UB**

- Stones
- TB, Bilharziasis
- Cystitis
- CA Prostate, Bladder
- BPH

**Hematuria**

**Gross**

- IgA nephropathy
- Drug induced
- Infection

**Microscopic**

- >3 RBC/HFF

- Exercise, Sexual
- Menstruation
- Infections
- TB, Stones, Maligna
- Glomerular dis.

**Initial**

- Wound

**Terminal**

- Bladder
- Kidney
3. Ans. d. Remission occurs in 70% cases of adult ITP
4. Ans. b. In the bone marrow smear, there is increased number of megakaryocytes

**Idiopathic Thrombocytopenic Purpura (ITP)**
- In ITP, platelets are coated with autoantibodies to platelet membrane antigens, resulting in splenic sequestration and phagocytosis by mononuclear macrophages.
- The resulting shortened life span of platelets in the circulation, together with incomplete compensation by increased platelet production by bone marrow megakaryocytes, results in a decreased platelet count.

5. Ans. d. An increase in platelet count on corticosteroid therapy
6. Ans. c. After ligating the splenic artery
7. Ans. a. Immediately after ligating splenic artery

**HYPSplenism**
- Characterized by splenic enlargement, any combination of anemia, leucopenia or thrombocytopenia, compensatory bone marrow hyperplasia and improvement after splenectomy.
- Careful clinical judgment is required to balance the long- and short-term risks of splenectomy against continued conservative management.

8. Ans. d. Hypocellular bone marrow (Ref: Sabiston 19/e p1553-1554; Schwartz 9/e p1257; Bailey 26/e p1090, 25/e p1104; Shackelford 7/e p1614, 1631)

9. Ans. a. Bone marrow hypoplasia
10. Ans. a. Pancytopenia, b. Thrombocytopenia, c. Leucopenia

**Splenectomy**
11. Ans. d. Atelectasis (Ref: Sabiston 19/e p1558-1559; Schwartz 9/e p1250-1262; Bailey 26/e p1096, 25/e p1109-1110; Shackelford 7/e p1674-1676)

### Complications of Splenectomy

<table>
<thead>
<tr>
<th>Pulmonary Complications:</th>
</tr>
</thead>
</table>
| Left lower lobe atelectasis: MC complication
| Pleural effusion
| Pneumonia

<table>
<thead>
<tr>
<th>Hemorrhagic Complications:</th>
</tr>
</thead>
</table>
| Subphrenic hematoma

<table>
<thead>
<tr>
<th>Infectious Complications:</th>
</tr>
</thead>
</table>
| Subphrenic abscess
| Wound infection

<table>
<thead>
<tr>
<th>Pancreatic Complications:</th>
</tr>
</thead>
</table>
| Pancreatitis
| Pseudocyst
| Pancreatic fistula

<table>
<thead>
<tr>
<th>Thromboembolic Complications:</th>
</tr>
</thead>
</table>
| DVT
| Portal vein thrombosis

- DVT prophylaxis is routinely recommended.
- In patients with hemolytic anemia or myeloproliferative disorders and splenomegaly, thrombotic risk is heightened. Particularly the risk of portal vein thrombosis.
- Patients undergoing splenectomy for malignancy or myeloproliferative disorders should be strongly considered for perioperative pharmacoprophylaxis, either LMWH or unfractionated heparin.

12. Ans. a. Trauma (Ref: Sabiston 19/e p1558-1556; Schwartz 9/e p1250; Bailey 26/e p1095, 25/e p1104-1108; Shackelford 7/e p1659-1670; CSDT 11/e p655)

Overall, the most common indication for splenectomy is trauma to the spleen, whether external trauma (blunt or penetrating) or operative injury (e.g., during operative procedures for other reasons).
## Indications for Splenectomy

<table>
<thead>
<tr>
<th>Splenectomy always indicated:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary splenic tumor</td>
</tr>
<tr>
<td>Hereditary spherocytosis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Splenectomy usually indicated:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary hypersplenism</td>
</tr>
<tr>
<td>Chronic ITP</td>
</tr>
<tr>
<td>Splenic vein thrombosis causing gastric varices</td>
</tr>
<tr>
<td>Splenic abscess</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Splenectomy sometimes indicated:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autoimmune hemolytic disease</td>
</tr>
<tr>
<td>Elliptocytosis with hemolysis</td>
</tr>
<tr>
<td>Nonspherocytic hemolytic anemia</td>
</tr>
<tr>
<td>Hodgkin's disease (for staging)</td>
</tr>
<tr>
<td>Thrombotic thrombocytopenic purpura</td>
</tr>
<tr>
<td>Idiopathic myelofibrosis</td>
</tr>
<tr>
<td>Splenic artery aneurysm</td>
</tr>
<tr>
<td>Wiscott-Aldrich syndrome</td>
</tr>
<tr>
<td>Gaucher's disease</td>
</tr>
<tr>
<td>Mastocytosis (aggressive disease)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Splenectomy rarely indicated:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic leukemia</td>
</tr>
<tr>
<td>Splenic lymphoma</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Splenectomy not indicated:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macroglobulinemia</td>
</tr>
<tr>
<td>Thalassemia major</td>
</tr>
<tr>
<td>Sickle cell disease</td>
</tr>
<tr>
<td>Congestive splenomegaly and hypersplenism due to PHTN</td>
</tr>
<tr>
<td>Felty's syndrome</td>
</tr>
<tr>
<td>Hairy cell leukemia</td>
</tr>
<tr>
<td>Chediak-Higashi syndrome</td>
</tr>
<tr>
<td>Sarcoidosis</td>
</tr>
</tbody>
</table>

13. Ans. b. Sickle cell disease

Splenectomy is not curative in sickle cell disease.

14. Ans. d. All

15. Ans. a. ITP


17. Ans. b. Sickle cell anemia

<table>
<thead>
<tr>
<th>Autosplenectomy</th>
<th>Sickle cell anemia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autonephrectomy</td>
<td>Renal TB</td>
</tr>
</tbody>
</table>

18. Ans. d. E. coli (Ref: Sabiston 19/e p1558-1560; Schwartz 9/e p1261-1263; Bailey 26/e p1094-1096, 25/e p1109-1110; Shackelford 7/e p1674-1675)

**Splenectomy**

Most serious sequela is overwhelming postsplenectomy infection (OPS), with meningitis, pneumonia, or bacteremia.

- Older studies have demonstrated that the risk of OPSI is greatest within the first 2 years after splenectomy but recent studies have confirmed that a lifelong risk remains.9
- One third of cases occur more than 5 years after surgery, with the overall incidence reported to be 3.2% to 3.5%.
- For those who acquire OPSI, mortality is between 40-50%.
- Risk is greatest in patients with thalassemia major and sickle cell disease.

OPS is typically caused by polysaccharide-encapsulated organisms, such as Streptococcus pneumoniae, Neisseria meningitidis, and Hemophilus influenzae.
**Spleen Outcomes**

<table>
<thead>
<tr>
<th>Increased risk of infections</th>
<th>Hematologic outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spleenectomy</td>
<td>Immediately after splenectomy:</td>
</tr>
<tr>
<td>Life-threatening infection in asplenic patients is attributable to loss of splenic macrophages, diminished transfusion production, and loss of spleen’s reticuloendothelial screening function.</td>
<td>Leukopenia</td>
</tr>
<tr>
<td>After splenectomy, ability to filter and phagocytose bacteria, particularly encapsulated bacteria (Streptococcus pneumoniae, Hemophilus influenzae, Neisseria meningitides) and parasitized blood cells is lost.</td>
<td>Thrombocytosis (these levels return to normal within 2-3 weeks).</td>
</tr>
<tr>
<td>MC Infection after splenectomy: Streptococcus pneumoniae (50-90% cases)</td>
<td>Chronic manifestations:</td>
</tr>
<tr>
<td>Other common bacterial infections</td>
<td>Anosmia and polikilocytosis.</td>
</tr>
<tr>
<td>Hemophilus influenzae type b</td>
<td>Howell-Jolly bodies (nuclear remnants)</td>
</tr>
<tr>
<td>Meningococcus</td>
<td>Heinz bodies (denatured hemoglobin)</td>
</tr>
<tr>
<td>Group A and B streptococcus</td>
<td>Basophilic stippling and occasional nucleated erythrocytes</td>
</tr>
<tr>
<td>Capnocytophaga canimorsus</td>
<td></td>
</tr>
<tr>
<td>Enterococcus species</td>
<td></td>
</tr>
<tr>
<td>Bacteroides</td>
<td></td>
</tr>
<tr>
<td>Salmonella</td>
<td></td>
</tr>
<tr>
<td>Bartonella</td>
<td></td>
</tr>
</tbody>
</table>

**Ans. b. Maximum risk is within 1 year of splenectomy** (Ref: Sabiston 19/e p1559; Schwartz 9/e p1262; Bailey 26/e p1096, 25/e p1109-1110; Shackelford 7/e p1674-1676)

Infection may occur at any time after splenectomy; in one recent series, most infections occurred more than 2 years after splenectomy and 42% occurred more than 5 years after splenectomy.

**OVERWHELMING POSTSPLENECTOMY INFECTION (OPSI)**

- OPSI is the MC fatal late complication of splenectomy.

- Infection may occur at any time after splenectomy.
- In one recent series, most infections occurred more than 2 years after splenectomy and 42% occurred more than 5 years after splenectomy.

**Clinical Features**

- OPSI typically begins with a prodromal phase characterized by fever, rigors and chills and other nonspecific symptoms, including sore throat, malaise, myalgias, diarrhea, and vomiting.
- Many patients have no identifiable focal site of infection and present only with high-grade primary bacteremia.

- Progression of the illness is rapid, with the development of hypotension, disseminated intravascular coagulation, respiratory distress, coma, and death within hours of presentation.
- Despite antibiotics and intensive care, the mortality rate is between 50-70% for florid OPSI.
During this step, fingers of the other hand help in guiding/locating/stabilising the cord. The coverings of the cord are incised.

**Precautions**
- Do not damage testicular vessels
- Vas is separated. It is confirmed by its white colour, and it feels like a cord.
- Division of vas by three clamp method (Fig. 53.16).
- Vas is cut in two places A and B so that a piece of vas is removed, which can be sent for histopathology to confirm that it is vas.
- Since a piece of vas is removed, reunion of the cut ends will not occur.
- The two cut ends of vas are doubly ligated by using silk.

**7. Closure**
The skin is closed by absorbable one or two sutures so that removal not required.

**8. Postoperative management**
- Rest for a few hours
- Antibiotics and analgesics

**PEARLS OF WISDOM**
The procedure is repeated on the other side.

**9. Postoperative complications**
- Injury to the vessels, resulting in a large haematoma.
- Infection
- Testicular atrophy can occur a few years later. It is due to immunological reaction rather than diffuse atrophy.

**10. Advice at discharge**
To use other methods of family planning for two months while having sexual intercourse, as some sperms may be present in the distal end of the vas and seminal vesicle.

**PEARLS OF WISDOM**
Vasectomy being a part of family planning project, every student should be familiar with this.

**No scalpel vasectomy**
- It is a novel technique to do vasectomy through one single puncture which does not require any suturing. It is less traumatic than conventional vasectomy and shortens recovery time.
- The procedure is done with LA.
- A special instrument is used to puncture the scrotum and grasp the vas deferens. Vas is then cut and through the same puncture, the other side is also operated.

**TRACHEOSTOMY**
An opening made in the trachea is tracheostomy

**1. Indications**
- **Emergency:**
  - Choking of the larynx due to dentures, foreign bodies, fish bones, etc.
  - Stridor due to diphtheria, carcinoma larynx and bilateral recurrent laryngeal nerve paralysis after thyroidectomy.
- **Elective**
  - Coma
  - Tetanus
  - Barbiturate poisoning
  - Head injuries
  - Pulmonary insufficiency

**2. Contraindications**
- Aplastic carcinoma thyroid patients presenting with stridor due to infiltration of growth into trachea. It may not be possible to do a tracheostomy or an attempt to do tracheostomy may result in the growth fungating through the incision (which is best avoided). In such patients, **endotracheal intubation** is done if possible. If not possible, no other intervention is done.

**3. Position of the patient**
Supine with extension of the neck and head by keeping a sandbag or a pillow under the shoulders.

**4. Anaesthesia**
Local infiltration anaesthesia

**5. Preparation of the parts**
Iodine and spirit

**6. Procedure**
- **Incision:** Transverse incision for about 3–4 cm is made at the level of 2nd tracheal ring.
- **Dissection:** Skin, subcutaneous tissue and deep fascia are incised. Isthmus of thyroid is separated.
- **Procedure:** A transverse cut is made in the 2nd tracheal cartilage, its edge is held with Allis forceps and a small cuff of cartilage is removed. [Cricoid hook] can be used to stabilise the trachea (found more useful in children).
- A suitable-sized tracheostomy tube is introduced within.
- The cuff of tracheostomy tube is inflated by using 2–5 ml of air and is held in place by passing a tape around the neck.
- Confirm that the **tube** is in the trachea, not in the subcutaneous plane.
- Confirm air entry on both sides of lung.
7. Closure
Few interrupted skin sutures by the side of the tracheostomy tube and dressing is applied.

8. Postoperative management
- Suction of tracheostomy tube, regular dressing
- Humidification of air
- Check for air entry

9. Postoperative complications
- Wound infection
- Air leakage
- Improper air entry
- Cricoid stenosis (high tracheostomy).

Closure of tracheostomy
- Once patient improves and is able to take care of his own airway, the tracheostomy tube is blocked. Observe for 24–48 hours.
- If there is no respiratory distress, the cuff is deflated and the tube is removed. A few skin sutures can be put or dressing is applied. It closes automatically.

10. Advice at discharge
- Tracheostomy done after laryngectomy is permanent. Patients should learn to use metal tracheostomy, cleaning the tubes, etc.
- Inner tube should be removed, cleaned and replaced in cases of respiratory distress.

5. Preparation of the parts
Iodine and spirit

6. Procedure
Incision (Fig. 53.17)
A vertical incision of 6–8 cm is made below the umbilicus in the midline.

Layers opened
- Skin, subcutaneous tissue, and linea alba in the upper part of incision. (Below the semilunar line there is no linea alba).
- Rectus muscle is split in the midline (separated).

![Incision for SPC](image)

Fig. 53.17: Incision for SPC

- Extraperitoneal tissue with fat is seen.
- With blunt dissection, fat and peritoneum are swept upwards so that anterior wall of the bladder is seen with its peritoneal covering. The bladder is identified by perivesical plexus of veins or aspirating the urine with syringe and needle.
- Two stay sutures are applied on the anterior bladder wall. The bladder is incised and urine drained out. The opening is enlarged and a Malecot's catheter is introduced within. It is brought outside from the upper part of the incision and connected to a closed bag (uroSac) (Fig. 53.18).

![Completion of SPC](image)

Fig. 53.18: Completion of SPC

SUPRAPUBIC CYSTOSTOMY (SPC)

In this operation, urinary bladder is drained to the exterior by inserting a Malecot's catheter\(^1\) into the bladder.

1. Indication
Retention of urine due to any cause where a catheter or a dilator cannot be passed through the urethra to empty the bladder. However, this operation is rarely done nowadays since suprapubic catheterisation with a trocar and cannula has simplified the procedure.

2. Contraindication
Carcinoma bladder

3. Position of the patient
Supine

4. Anaesthesia
SA or GA

\(^1\)Malecot's catheter SPC is no longer done, trocar SPC is the choice today
Chest Trauma, Cardiothoracic Surgery

- Chest trauma
- Blunt trauma
- Pulmonary injuries
- Tracheobronchial injuries
- Myocardial contusion
- Surgical emphysema
- Mediastinal emphysema
- Mediastinal masses
- Pulmonary aspergilloma
- Congenital heart diseases
- Patent ductus arteriosus
- Coarctation of aorta
- Coronary artery bypass graft
- Off pump coronary artery bypass surgery
- Abdominal aortic aneurysms (AAA)
- What is new? Recent advances

CHEST TRAUMA

Introduction
In chest trauma, the mortality is very high unless promptly recognised and properly treated. The margin of safety is very slim, initial care dictates the final result. With varying degree of severity, chest injuries occur in almost 80% of road traffic accidents (Key Box 44.1).

MAIN AIMS OF RESUSCITATION
The standard method of resuscitation in all cases of polytrauma is as follows:

A. Airway
- Aspiration of blood and secretions from oral cavity, pharynx and trachea
- Introduce plastic airway
- Endotracheal intubation

B. Breathing
- Cricothyroidotomy as necessary
- Tracheostomy as necessary

C. Circulation
- Control of major and life-threatening bleeding
- Intravenous infusion

D. Disability
- Neurological

E. Exposure
- All clothing to be cut open without moving the patient
- All the above steps are taken by the trauma centre team simultaneously and not one by one
- Relieve pain. Do not sedate
- All open wounds of the chest to be covered
- Life-threatening injuries should be identified and treated immediately

KEY BOX 44.1

COMMON CAUSES
- Automobile accidents
- Gunshot wounds
- Slab injuries
- Blast injuries
- Crush injuries

ASSESSMENT OF INJURY

History
- Time since the injury
- Details of the injury from the bystander or the police
- High-speed deceleration injury (aortic and cardiac rupture to be ruled out).
- Crushing accidents (tracheobronchial and oesophageal tear).
- Sudden abdominal compression (ruptured diaphragm).
- In stab injuries, length of the knife and direction of stab.

**Examination**
- The clothing should be removed carefully without moving the patient.
- Palpate for clinical evidence of fracture ribs, surgical emphysema, any paradoxical movement of the ribs and auscultate for air entry in both lungs.
- Even if it is a trivial injury, the patient should be admitted and observed for a minimum of 24 hours before discharge.
- It is reasonable to do unilateral or bilateral closed tube thoracostomy (ICT) (Fig. 44.1) on suspicion of haemothorax or pneumothorax when the patient is in respiratory distress.

![Figure 44.1: Fracture ribs with haemothorax left side—intercostal tube has been inserted.]

**BLUNT TRAUMA TO THE CHEST**

**Causes**
- Road traffic accidents
- Fall from a height
- Crush injuries
- Assault with blunt object

**SIMPLE RIB FRACTURE**
Rib fracture can be single or multiple (Key Box 44.2).

**Single rib fracture**
- Often regarded as a trivial injury but should be treated with respect in elderly patients.
- Occurs due to direct injury or excessive flexion.
- The common site is at the costal angle or middle of the shaft.
- Patients will have pain on breathing, coughing and on palpation.

**KEY BOX 44.2**

**POINTS TO REMEMBER**
- Fractured rib is a marker of severe trauma—injury to bronchial plexus, subclavian artery and vein
- Displaced fracture of 8th–10th ribs—liver and spleen
- Fracture of 11th and 12th ribs—kidney
- Penetrating injury to left lower chest wall—heart, lung, diaphragm, stomach, and spleen
- They are treated with analgesics, intercostal nerve block and assurance.

**Multiple rib fractures**
- When there are multiple rib fractures without any pneumothorax or haemothorax and no other organs are involved, intercostal nerve block and small amount of narcotics are required.
- Strapping is occasionally necessary in young adults.
- In elderly patients, consider hospitalisation for observation, pain control and pulmonary toilet.
- Chest X-ray to be repeated after 24 hour and at the time of discharge, to rule out late onset pneumothorax.
- Intermittent use of velcro belt rib support. Inform the patient of deep breathing and coughing using the rib belt.
- Epidural analgesia is becoming the standard of care for pain management in patients with multiple rib fractures.

**STERNAL FRACTURE**
- Commonly due to steering wheel injury—blunt trauma.
- Usually occurs at the sternal angle.
- Associated with costochondral dislocations.
- Classified as displaced and nondisplaced fractures.
- Localised swelling, tenderness and deformity are the clinical findings.

**Treatment**
- Displaced fracture—requires surgical fixation
- Nondisplaced fracture—conservative management

**FLAIL CHEST**
This results from severe chest injuries with multiple rib fractures.
- Here there are fractures of four or more ribs at two or more places, anteriorly and posteriorly, so that certain segments of ribs will have no attachment to the chest wall. These ribs become torn due to intrathoracic negative pressure as the patient inhales and is driven outwards on expiration producing instability. This is called paradoxical respiration. It results in hypovolaemia, carbon dioxide retention and respiratory failure.

Flail chest is of three types: Anterior, posterior and lateral.